CADSES MAGIC

IPT SoftwareTool

Manual

documentation version 3.0.0

30 March 2008 r.

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1.Introduction

This document is for first time user of Magic SoftTool software. It introduces to concept of graphical user interface and functionality. In the last part of manual there is tutorial which step by step leads user from inputting model parameters through planning process and exporting results to Excel xls file.

SoftTool user is encouraged to read MAGIC maual. It can be found on project's web site. It contains informations about IPT magic aproach for ground water polution remediation and implemented hydrogeologic methods.

2.User manual

2.1.Installation

Installation steps.

1. If you don't have latest version of SoftTool go to project site(http://www.magic-cadses.com/) and download it. Software binaries are distributed as compressed zip archive.
2. Unzip archive containing application e.g. SoftTool.zip into your selected directory. If application is already uncompressed it can be simple copied from one location to another and then executed (as long as all subdirectories and files are included).

It is advised to distribute a whole package which is about 60MB.

Due to quite large size, sometimes smaller patches will be published in form of zipped archive with folder SoftTool in it. Patching older version simply rely on copying (overwriting) files from that folder to your application folder.

Unfortunately it is not possible at the moment to start application directly from CD or from another read-only protected media. Some functionality can work not properly. It is because of temporary GIS files written to “SoftTool\out” directory in installation folder.

2.2.System requirements

Application was tested on WindowXP, WindowsNT, Windows2000 operating systems. Older versions, like Windows95 or windows98 was not thoroughly tested and therefore are not supported. It can be be run on Linux, but needs Java5 with JAI and JAI-IO installed which is not included in installation package.

Computer which runs SoftTool should have at least about 100 megabytes free operating memory. The needed amount can grow especially when large GIS data sets are used. Processor with 1GHz clock or better should suffice.

2.3.Running application

Enter into unzipped or copied application directory e.g. **SoftTool**, and then double click executable file SoftTool.exe, with icon after a while, depending on quantity of free resources in system(memory and power of processor), application will start. Before, almost immediately should appear splash screen with logo of Magic and Cadses. Progress bar at the bottom indicates progress of loading classes which names are shown at the top of the form.

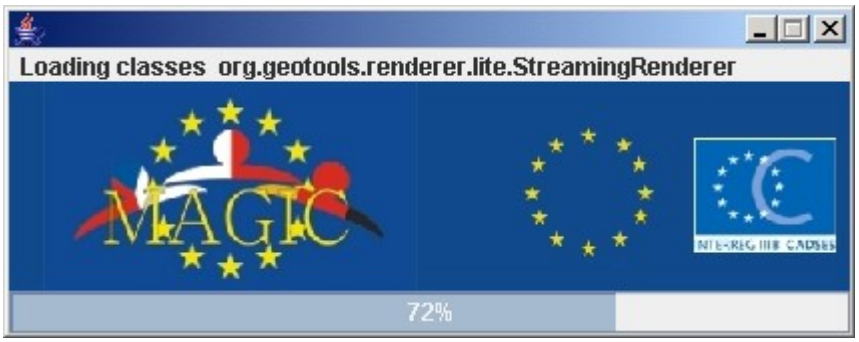


Fig. 1 SoftTool splash screen

If application not starts for longer period it may mean that something is wrong with this installation. User can always look at [SoftTool]\log\logfile.log, it may help computer staff to fix software installation problems.

MAGIC
Sofware Tool for integral pumping tests.
To learn the IPT method see maual on a project site.
To start learning the software press F1 key or go to application's subdirectory doc\SoftTool.pdf.
MAGIC
http://www.magic-cadses.com
Show this message and load sample project on start?
Close

Fig. 2 SoftTool welcome screen

When application is loaded user will see welcome screen of the application. User can open link to project site page http://www.magic-cadses.com/ and see

project details if isn't familiar yet. When CheckBox “Show this message...” is selected then the message and example project ([SoftTool]\data\sample.xml) will be always loaded when application starts. It can be opened from Menu Help\About.

After proper starting application main window should appear, which can be seen on figures below.

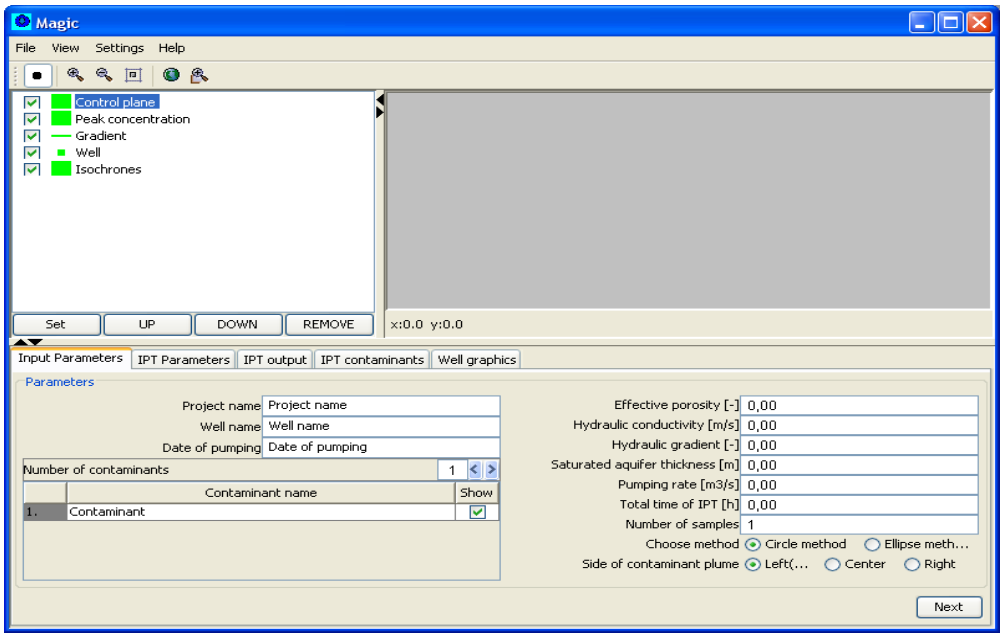


Fig. 3 Application MAGIC main window

Application main window without default project loaded.

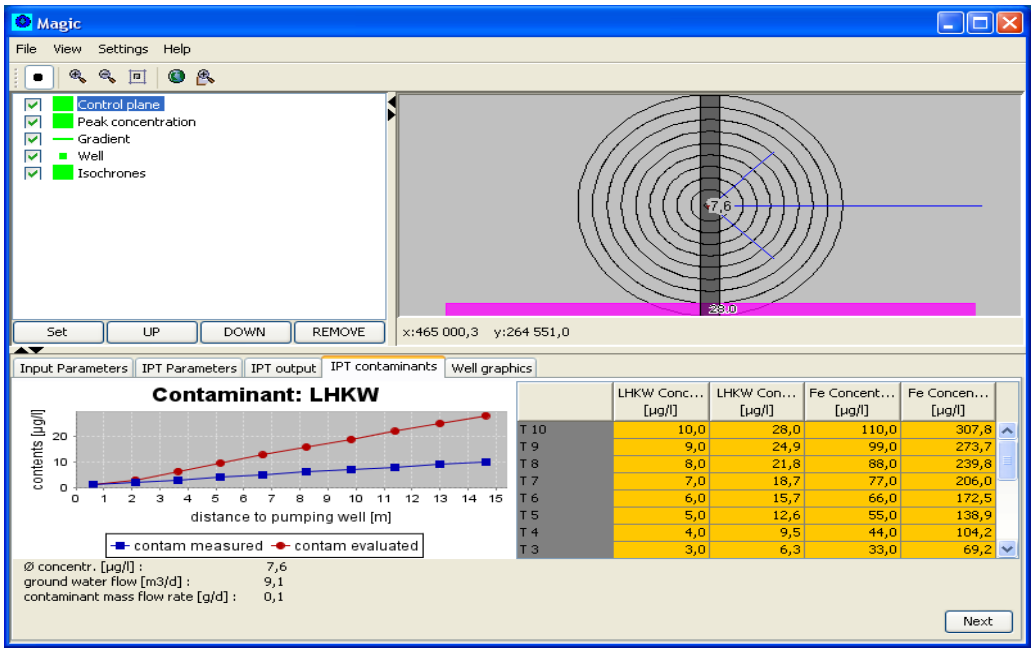
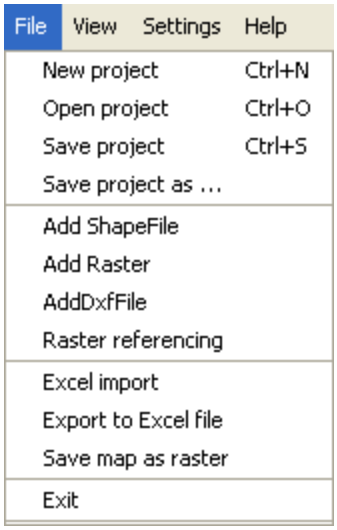


Fig. 4 Application MAGIC main window with sample project loaded

Application main window with default project loaded.

2.4.User Interface



2.4.1.Menu File

Fig. 5 Menu File

Menu item **New project** clears calculations, planning forms and map, and let user to start inputting new project.

Menu item **Open project** opens dialog window for choosing project (.xml) files. This are common text files with markups , which can be nicely previewed in Internet browser or externally from application changed in text editor like Notepad.

Menu item **Save project** saves changes in current project. If current project has neither been opened nor saved then Save as ... dialog window opens.

Menu item **Save project as...** let user to point new location of project file.

Next group of menu items refer adding GIS data layers.

Menu item **Add ShapeFile** opens dialog window for choosing files in folders of operating system. By default filter for decreasing list of files is enabled for those which have extension ***.shp**. After successful file chose new layer is added to a Map with default symbol. Shape file is a standard introduced by ESRI TM, and is widely used to interchange or export GIS data.

Menu item **Add Raster** opens dialog window for choosing supported raster files. By default filter decreasing list of files is enabled. To map can be added

calibrated rasters in formats: JPG+jgw and TIF+tfw. After successful file chose next layer will be added to a map. So called world file (*.jgw, *.tfw) is extension for GIS calibrating raster data files. It is common text file with 6 transformation parameters: real lower left, pixel size, and rotation. Nowadays TIF format is extended and can store calibrating informations itself in so called GeoTIF tags, and therefore do not need additional *.tfw file.

Menu item **Add Dxf File** opens dialog window for choosing *.dxf files in the file system. Current version can only operate with single dxf file.

Menu item **Raster referencing** opens dialog window for choosing raster files (*.jpg, *.tif), which can be referenced in further operations. When raster is successfully chose, it is opened in referencing panel in the bottom of main frame.

Next group of menu items refer to importing and exporting data and settings.

Menu item **Excel import** opens file dialog for choosing Excel TM *.xls files. When successfully chose.

Menu item **Export to Excel file** opens file dialog for output choosing Excel TM *.xls files. Model parameters and calculations are exported to template xls file which can be found and simply modified in [SoftTool]\res\export_ipt.xls

Menu item **Save map as raster** opens dialog window which lets to choose folder and filename for file of type BMP, PNG, JPG, TIF. In this file will be saved current map view

Menu item **Exit** finishes operating with application. Closing is preceded with question if save project or cancel operation.

2.4.2.Menu View

Menu View let user to switch views in panels of main frame. In upper panel there is legend and beside it, to the right: planning or import or map panels. Legend can be switched off, so the whole upper panel is filled with one of planning, importing or map according to operations performed by user.

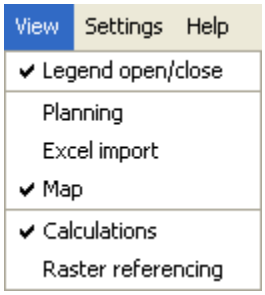


Fig. 6 Menu View

By default as can be seen on Fig.2. Application MAGIC main window legend, map and calculations panels are switched on.

Menu item **Legend open/close** switches visibility of legend panel.

Next section is related to upper panel.

Menu item **Planning** switches on planning panel

Menu item **Excel import** switches on panel with excel tab sheets with cells if only any import source is chose. It is automatically set visible when Excel file is chose for importing.

Menu item **Open map** switches on map panel view.

Next section is related to bottom panel

Menu item **Calculations** switches on visibility of main application panel for calculations of IPT tests.

Menu item **Raster referencing** switches on visibility of referencing panel. It is set visible automatically after choosing a raster for georeferencing.

2.4.3.Menu Settings

It lets user change miscellaneous application settings.

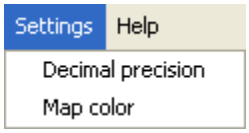


Fig. 7 Menu Settings

Menu item **Decimal precision** opens dialog for setting global application parameter of decimal places after coma for decimal numbers. Changes affects, numbers displayed in IPT tables and coordinates displayed in lower left corner of main window. It does not change settings of model parameters inputting fields.

Menu item **Map color** sets background color of the map. IT opens default color selection dialog window.

2.4.4.Menu Help

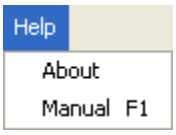


Fig. 8 Menu Help

Menu item **About** opens a form with short information concerning software and project Magic.

Menu item **Manual** opens this document (“IPT SoftwareTool Manual) in pdf format from [SoftTool]\res\SoftTool.pdf

2.5.Map panel

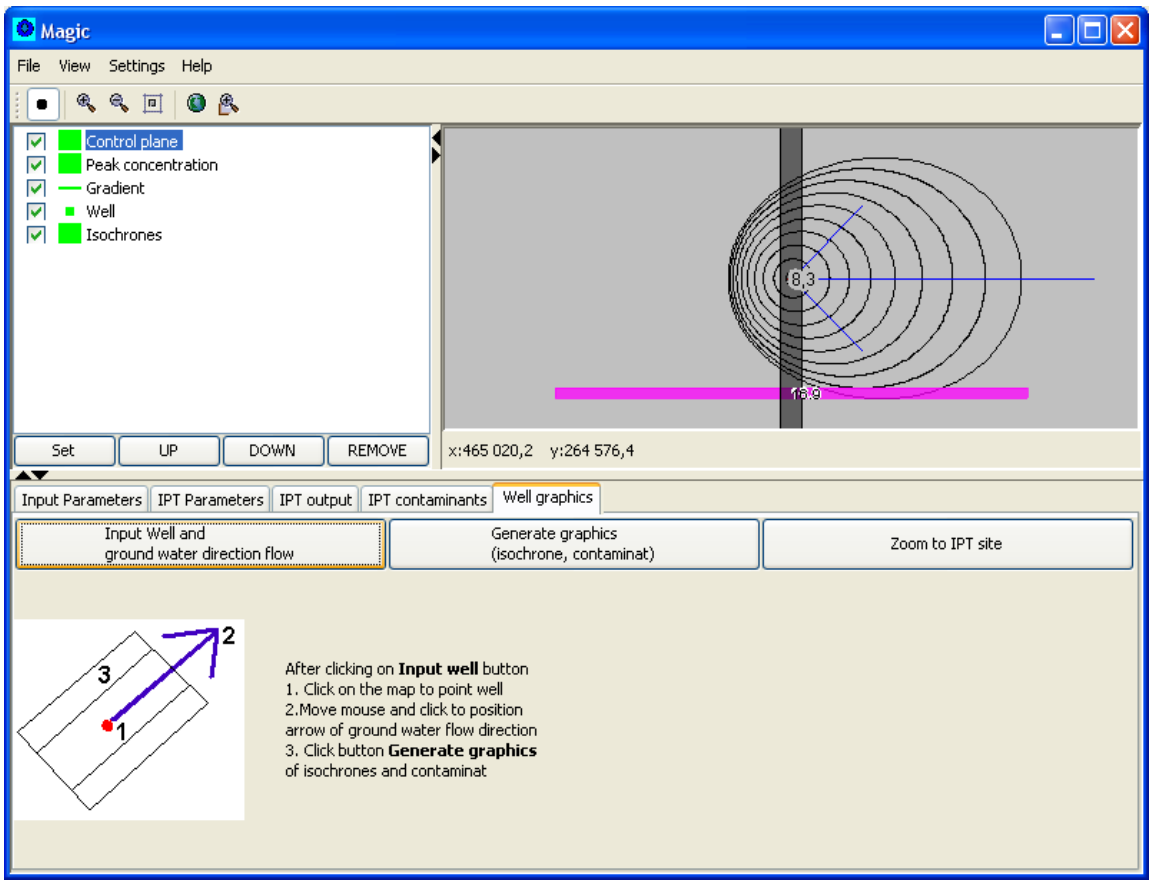

Magic
File View Settings Help
Control plane
Peak concentration
Gradient
Well
Isochrones
Set UP DOWN REMOVE
x:465 020,2 y:264 576,4
Input Parameters IPT Parameters IPT output IPT contaminants Well graphics
Input Well and ground water direction flow
Generate graphics (isochrone, contaminat)
Zoom to IPT site
After clicking on Input well button
1. Click on the map to point well
2.Move mouse and click to position arrow of ground water flow direction
3. Click button Generate graphics of isochrones and contaminat

Fig. 9 Application main window with raster and vector layers in map panel.

In lower left corner of Map Panel is displayed cursor X and Y position x:465 121,9 y:264 659,4 in coordinate system of layers.

2.5.1.Tools for operating with map

Main ToolBar by default is situated above map. It can be dragged with mouse cursor outside area of main window.

- reset tool, turns off any map tool accessible from toolbar.

- zoom in view. To utilize this tool it should be activated by clicking this button. Then it is possible clicking a map in chosen place. View will be enlargeed about two times.

- zoom out view. To utilize this tool it should be activated by clicking this button. Then it is possible clicking a map in chosen place. View will get smaller about two times.

- pan view. To utilize this tool it should be activated by clicking this button. Then it is possible clicking a map in chosen place. Pointed place will be centered in map view .

- full view. After clicking this tool in map view will be seen all features of all layers.

- zoom to layer selected in legend.

2.5.2.Legend panel

Legend form shows contents of the map. Additionally it allows to manage content of the map in comfortable manner. Legend can be set visible or invisible in Menu **View\Legend open close**. At the bottom of the panel are situated buttons for changing settings, moving layers up and down or remove layer from the view. Checboxe to the left of layer name steers current layer visibility .

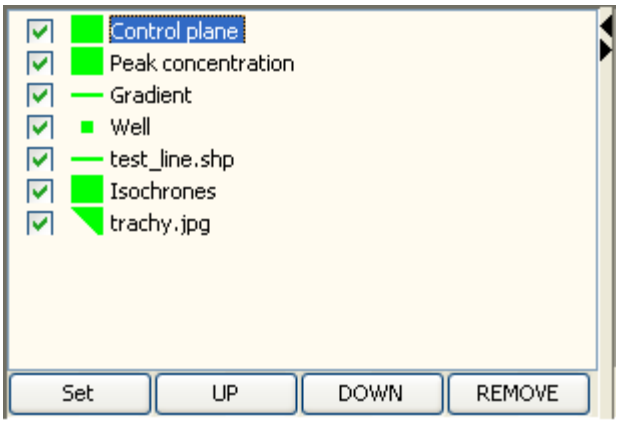


Fig. 10 Legend - map content

Layer types icons:

- vector polygon layer

- vector line layer

- vector point layer

- raster layer (tif, jpg, dxf)

Button **Remove** removes layer from the current map view.

Buttons **Up** and **Down** changes order of layers

Button **Set** opens frame for changing settings of layers.

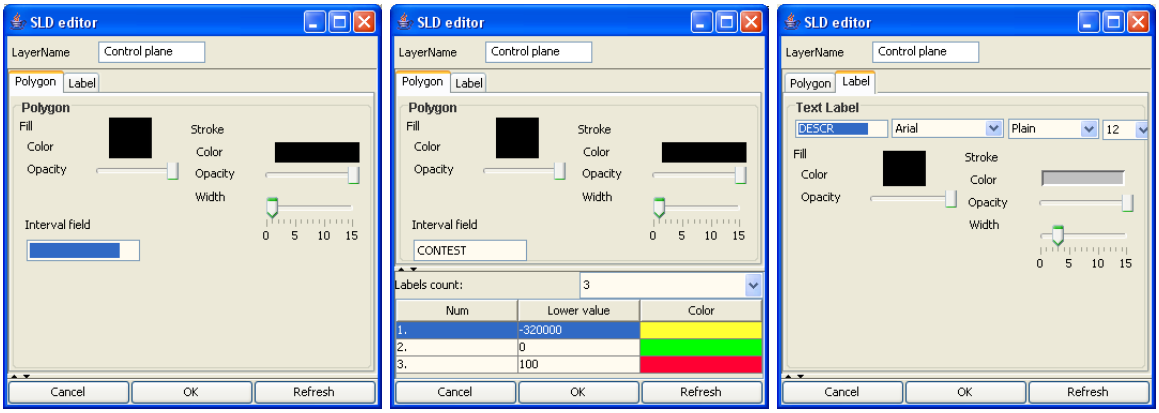


Fig. 11 Layer settings frame

Vector layers have quite wide possibility of changing settings.

Simple renderer settings are on first image in above figure set. The tab differs slightly for point, line and polygon feature types. For **Line** features color, opacity and width of the stroke can be set. For **Polygon** layer type user can set color and opacity of the fill(inside). For **Point** features type of symbol can be additionally set.

When **Interval field** is set then interval renderer is used. User can set count of interval and then lower value of each interval. In the example on second image in

above figure set there is used yellow color for features with values CONTEST = <-320000,0); green for CONTEST=<0,100) and red for CONTEST=<100, 320000)

Label renderer can be modified on Label tab of symbol settings frame. Third image lon figure sets above shows the label tab. Label values are taken from field which is set in the firt combo box. Then user can modify font atributes, font color and hallo parameters around the label.

Raster layer has not changable settings except its name in legend. Dxf cad layer is only for displaying and in principle it is treated like a raster layer by the software.

2.6.Calculations panel

Calculations panel is in the bottom of main window, if it is not visible then it can be switched on with **Menu View\Calculations**. First and second tabs are for inputting parameters of model and contaminant calculations. Next two tabs shows results of calculations, last fifth tab is for generating isochrone and conaminants graphic.

Generally, all white fields and table cells are editable. Gray fields are not editable and are generated by system. Orange fields are not editable and contain results of calculations.

Decimal sign is determined from system setting and user is forced to use the sign. Only digits and decimal sign are allowed to be inputted in numerical fields.

Yellow color indicates focus of the input box, changes are not notified by a software until fields turn it color to white!

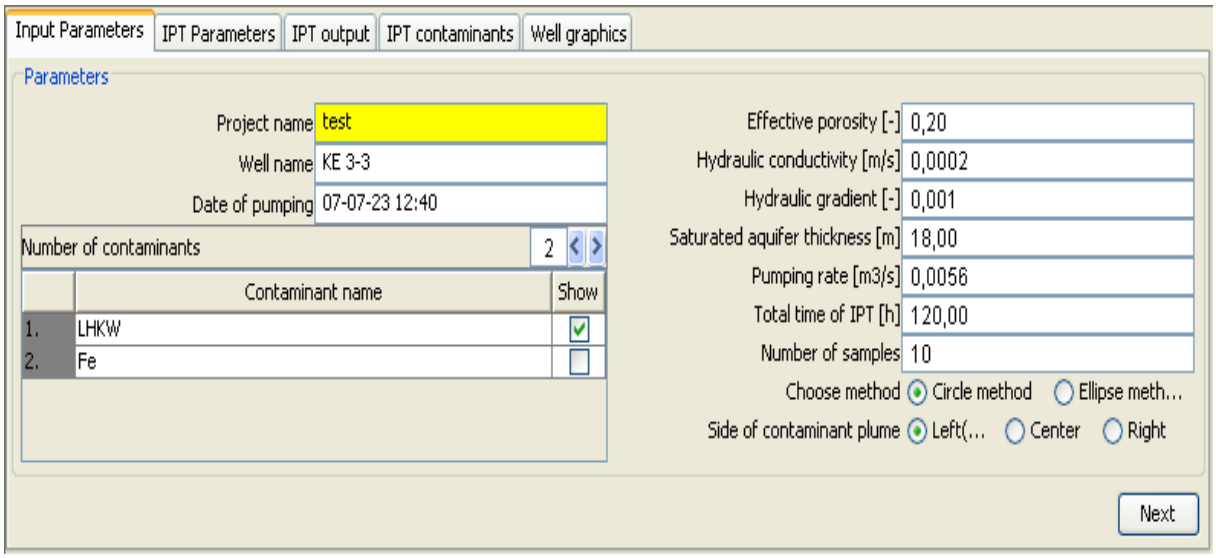


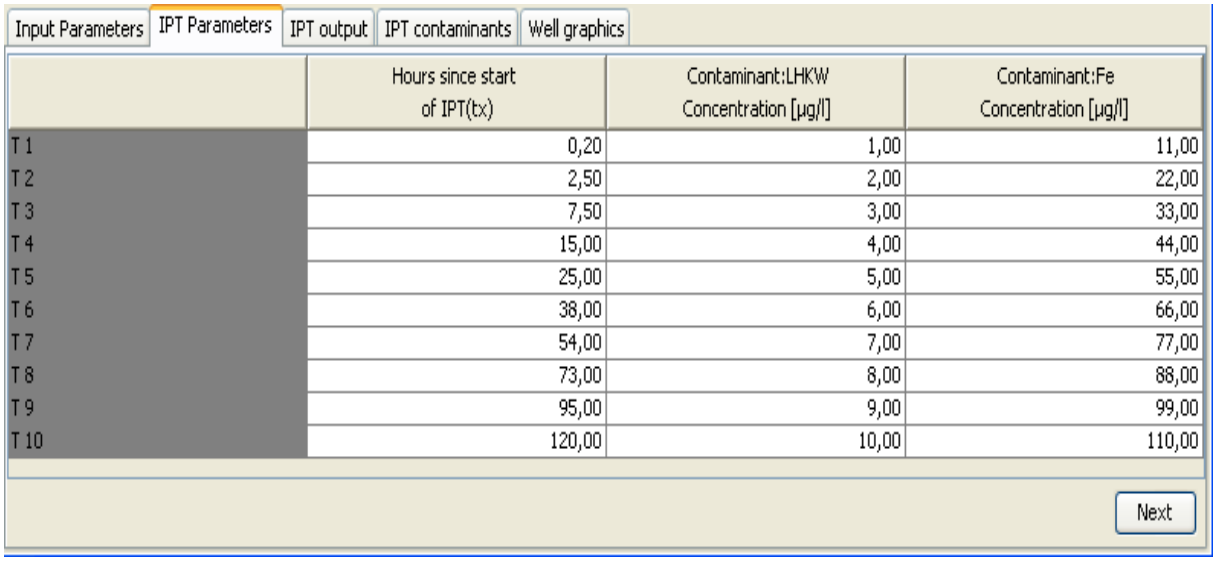
Fig. 12 IPT Calculations panel - Input Parameters tab.

Input Parameters tab is for inputting basic model parameters. Respectively these are: effective. Kolejno są to: , effective porosity [n] , hydraulic conductivity. [K] , hydraulic gradient [i], aquifer thickness, pumping rate [Q], total time of IPT, number of samples. Before inputting accordance of input units should be checked

Number of samples changes number of rows in table on tab IPT Parameters.

Choose method radio buttons enables changing method of calculations between Circle and Elliptic

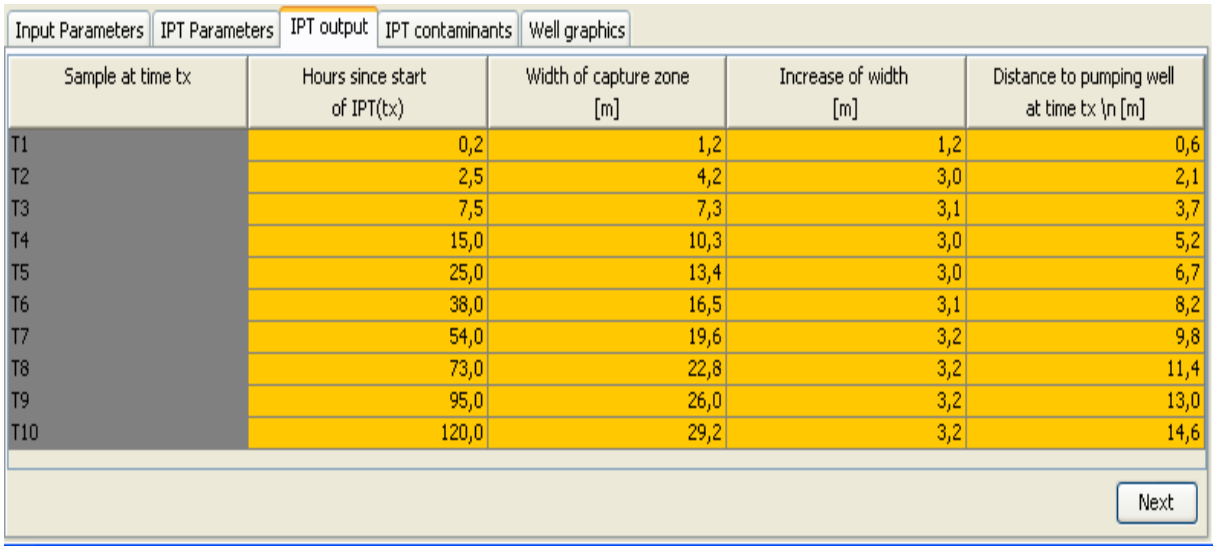
User can choose position of the contaminant plume. Contaminants can flow completely on one side: left or right, accordingly to gradient arrow. Centered plum is showed as symmetrical stripes along gradient.



	Hours since start of IPT(tx)	Contaminant:LHKW Concentration [µg/l]	Contaminant:Fe Concentration [µg/l]
T 1	0,20	1,00	11,00
T 2	2,50	2,00	22,00
T 3	7,50	3,00	33,00
T 4	15,00	4,00	44,00
T 5	25,00	5,00	55,00
T 6	38,00	6,00	66,00
T 7	54,00	7,00	77,00
T 8	73,00	8,00	88,00
T 9	95,00	9,00	99,00
T 10	120,00	10,00	110,00

Fig. 13 IPT Calculations panel – IPT parameters tab

In table on IPT Parameters should be inputted test parameters, these are pairs: time of sample collection since start of IPT and laboratory measured contaminant contents in sample.

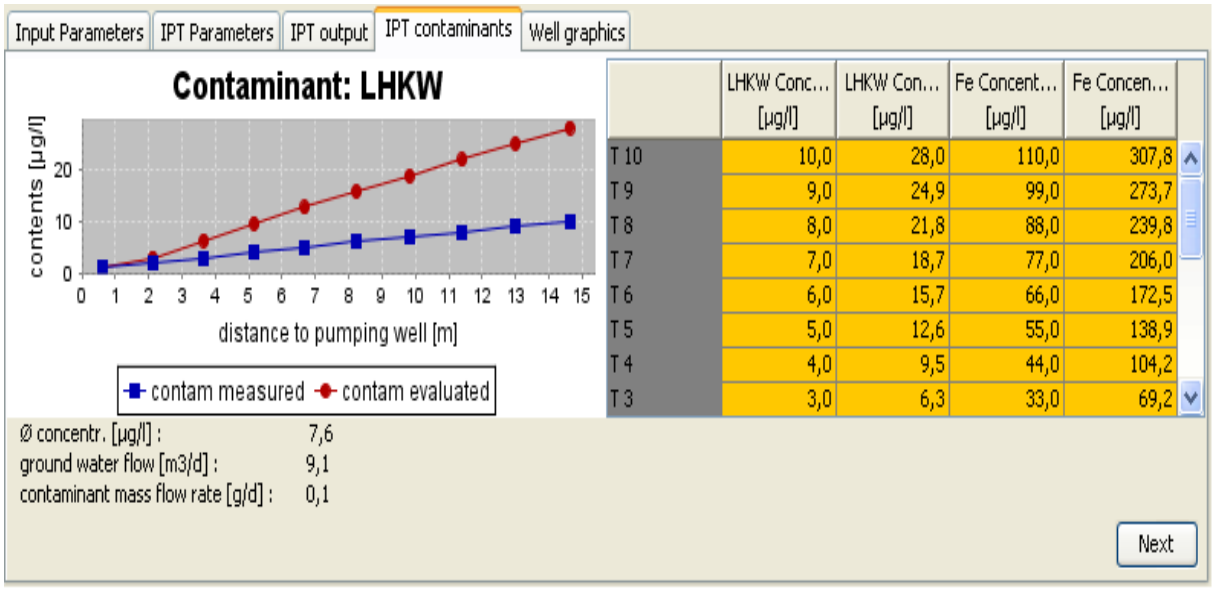


Sample at time tx	Hours since start of IPT(tx)	Width of capture zone [m]	Increase of width [m]	Distance to pumping well at time tx \n [m]
T1	0,2	1,2	1,2	0,6
T2	2,5	4,2	3,0	2,1
T3	7,5	7,3	3,1	3,7
T4	15,0	10,3	3,0	5,2
T5	25,0	13,4	3,0	6,7
T6	38,0	16,5	3,1	8,2
T7	54,0	19,6	3,2	9,8
T8	73,0	22,8	3,2	11,4
T9	95,0	26,0	3,2	13,0
T10	120,0	29,2	3,2	14,6

Fig. 14 IPT Calculations Form – IPT Output tab.

On IPT Output are shown results that come form Bear & Jacobs equation. Most interesting is column: Width of capture zone (it is width of capture zone dependent on pumping time)

When the whole text of column headers is not viewable it is possible to keep mouse cursor for a while over one of them and ToolTip message will appear.



	LHKW Conc... [µg/l]	LHKW Con... [µg/l]	Fe Concent... [µg/l]	Fe Concen... [µg/l]
T 10	10,0	28,0	110,0	307,8
T 9	9,0	24,9	99,0	273,7
T 8	8,0	21,8	88,0	239,8
T 7	7,0	18,7	77,0	206,0
T 6	6,0	15,7	66,0	172,5
T 5	5,0	12,6	55,0	138,9
T 4	4,0	9,5	44,0	104,2
T 3	3,0	6,3	33,0	69,2

Fig. 15 Calculations Form – IPT contaminants

IPT contaminants tab shows results of IPT calculations for contaminant concentrations in ground water samples .

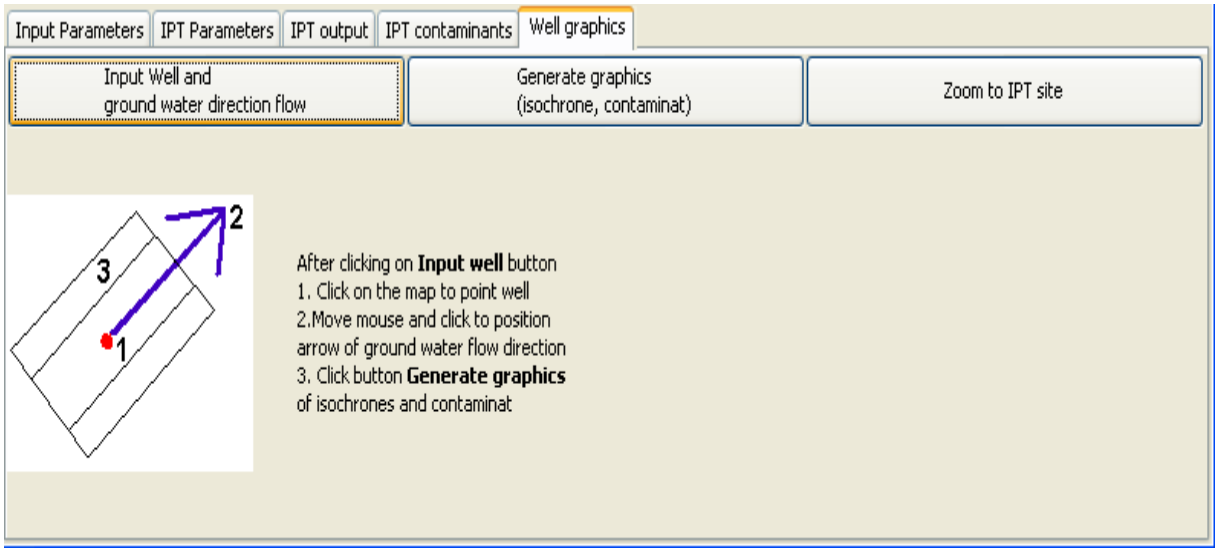


Fig. 16 Form od IPT calculations, Well graphic tab

Last tab - **Well graphics** is for visualizing calculations results on the map. For pointing well position and ground water flow direction, map view first should be zoomed and paned to proper place. Next **Input well button and Ground water direction flow** should be pressed, it will change name for **Inputting well and ground water direction flow**, then it is possible to point well by clicking on map in a proper palace.

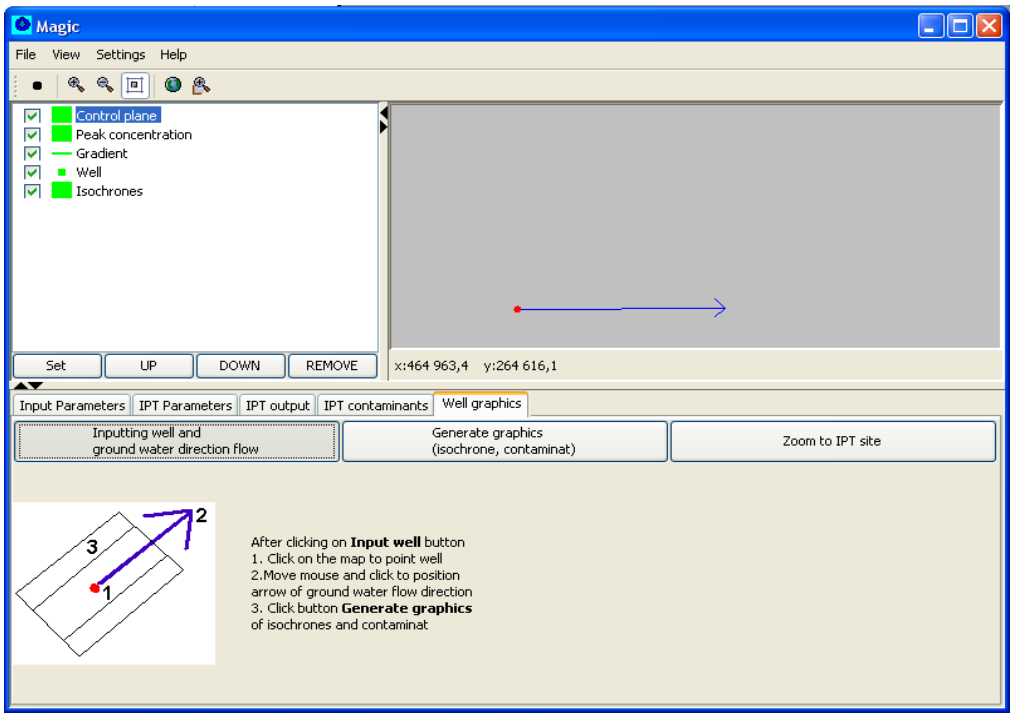


Fig. 17 Pointing well and inputting ground water direction flow.

After inputting well which by default is marked with red point, ground water direction flow should be pointed. Behind mouse cursor shows and moves blue arrow whose starting point is fasten to the well. Next click will finish drawing arrow.

Immediately isochrones, contaminant and control plane should be generated and shown up.

Button **Generate graphics** on IPT Calculations should be pressed to refresh changes. At the moment layers: Well, Peak concentration, Gradient, Isochrones are filled with data. ShapeFiles in aplication **\out** folder are regenerated.

Although any time user change one of the parameters on **Input Parameters** tab or **IPT Parameters** tab it is enough to select IPT Contaminants tab to see impact of the changes on contaminant concentration on a Map, table and chart.

Afterwards user can click **Zoom to IPT site** button, view will be changed to see stripes of estimated contaminants.

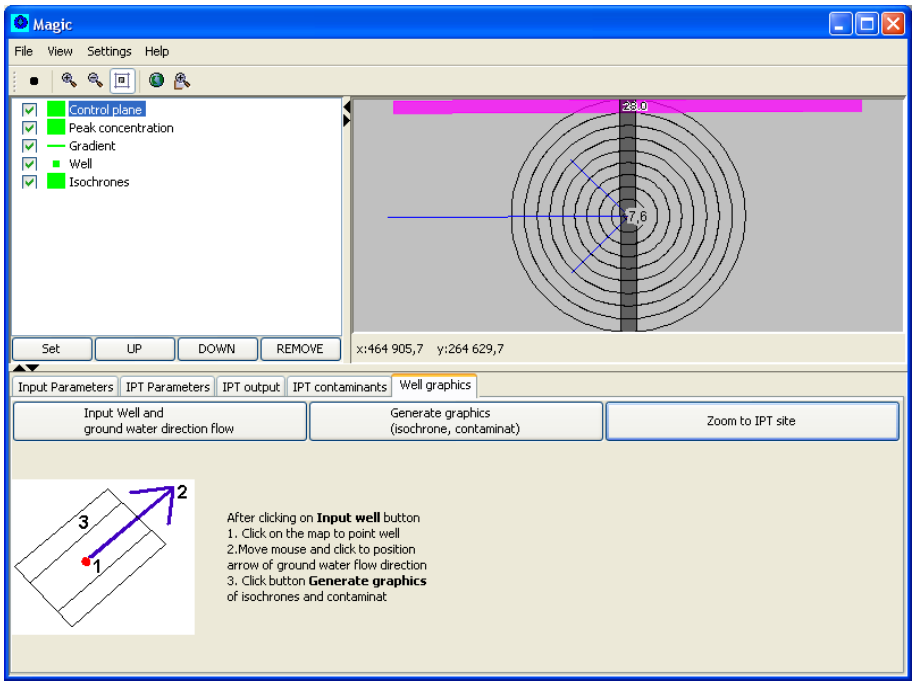

Magic
File View Settings Help
Control plane
Peak concentration
Gradient
Well
Isochrones
Set UP DOWN REMOVE
x:464 905,7 y:264 629,7
Input Parameters IPT Parameters IPT output IPT contaminants Well graphics
Input Well and ground water direction flow
Generate graphics (isochrone, contaminat)
Zoom to IPT site
After clicking on Input well button
1. Click on the map to point well
2.Move mouse and click to position arrow of ground water flow direction
3. Click button Generate graphics of isochrones and contaminat

Fig. 18 Graphics of circle method isochrones and left sided contaminant plume

When circle method is selected concentrically round the well lays isochrones (pumping zones) for subsequent measurements. Along water flaw direction arrow are drawn calculated contaminant concentrations. The more darker blue color is, the more contaminant contents is in ground water.

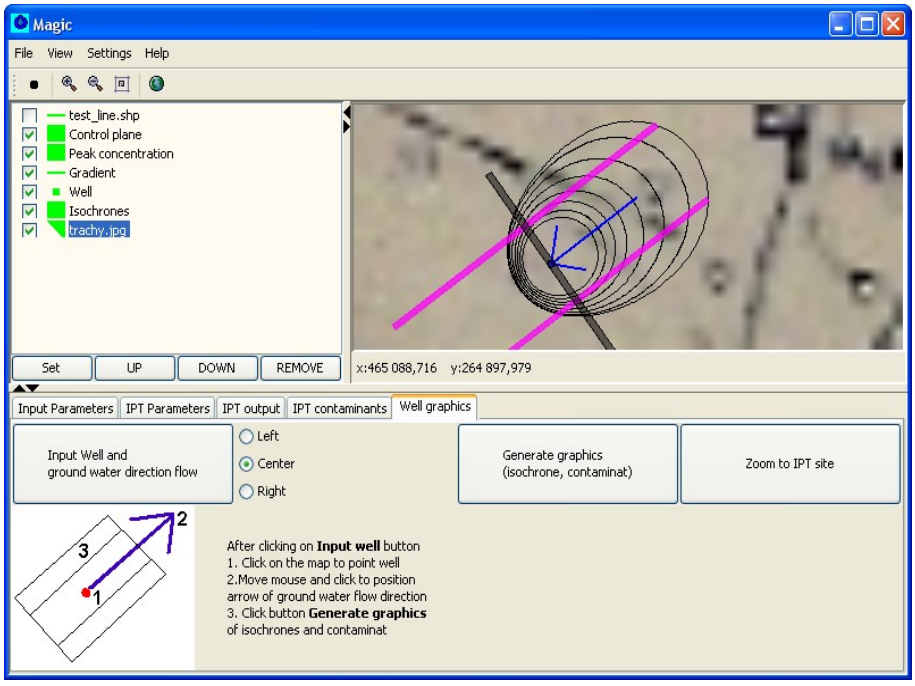


Fig. 19 Graphics of ellipse method with centered plume

2.7.Planning

It is possible to open planing panel wheneever needend, on the begining of the process or in the middle. During opening planing panel parameters and timing of the test is rewritten from Calculations panel.

Calculations and chart refresh is performed whenever any editable(white ones) parameter changes. Application recalculates model when „yellow" field turns its colour to whit or Enter key is pressed.

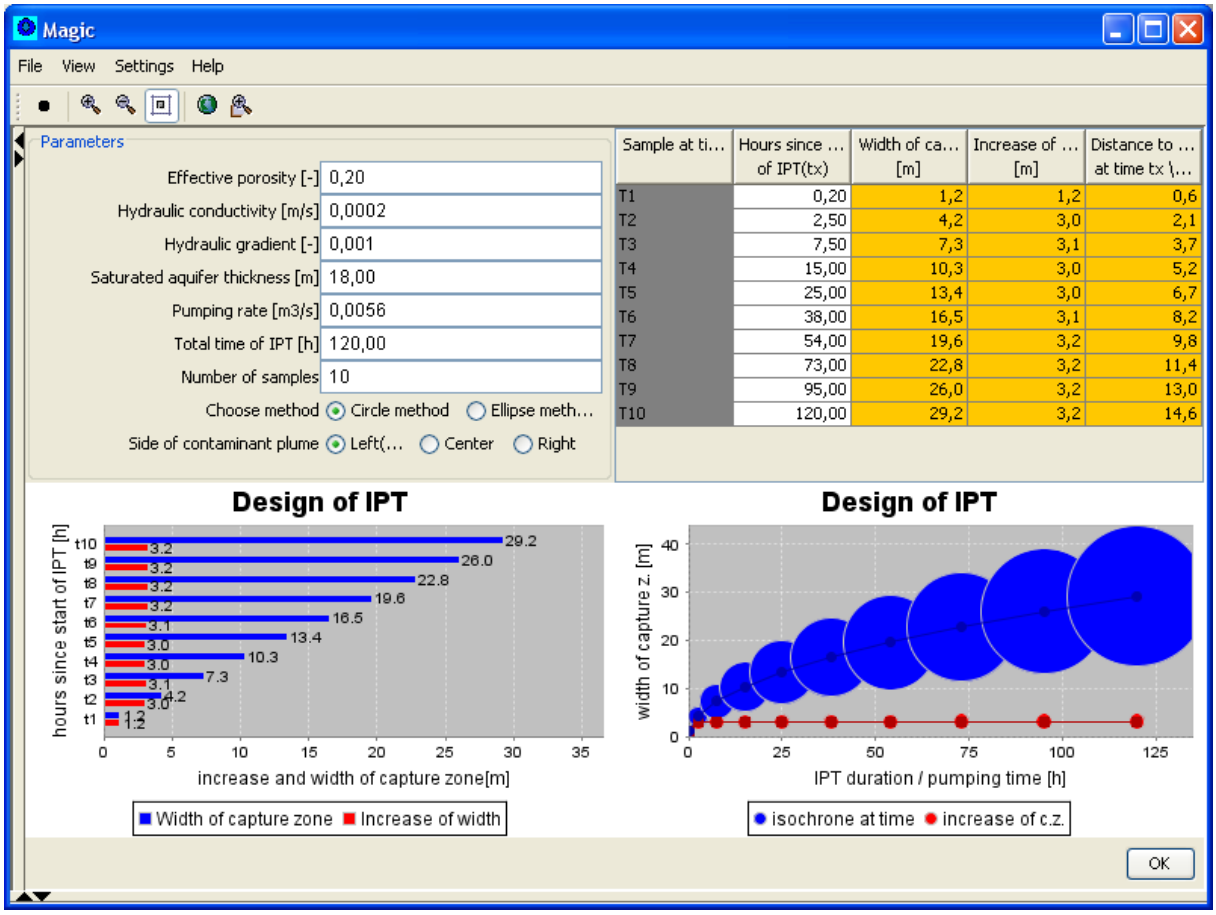

Magic
File View Settings Help
Parameters
Effective porosity [-] 0,20
Hydraulic conductivity [m/s] 0,0002
Hydraulic gradient [-] 0,001
Saturated aquifer thickness [m] 18,00
Pumping rate [m3/s] 0,0056
Total time of IPT [h] 120,00
Number of samples 10
Choose method Circle method Ellipse meth...
Side of contaminant plume Left(... Center Right
Sample at ti... | Hours since ... of IPT(tx) | Width of ca... [m] | Increase of ... [m] | Distance to ... at time tx \...
T1 0,20 1,2 1,2 0,6
T2 2,50 4,2 3,0 2,1
T3 7,50 7,3 3,1 3,7
T4 15,00 10,3 3,0 5,2
T5 25,00 13,4 3,0 6,7
T6 38,00 16,5 3,1 8,2
T7 54,00 19,6 3,2 9,8
T8 73,00 22,8 3,2 11,4
T9 95,00 26,0 3,2 13,0
T10 120,00 29,2 3,2 14,6
Design of IPT
hours since start of IPT [h]
increase and width of capture zone[m]
Width of capture zone
Increase of width
Design of IPT
width of capture z. [m]
IPT duration / pumping time [h]
isochrone at time
increase of c.z.
OK

Fig. 20 Planning panel

Charts at the bottom of the panel visualize increase of isochrones, and helps this way to prepare suitable test.

Button **OK** permanently overwrites parameters in calculation panel

Until yellow color of changed input box is switched to white changes are not visible for calculations.

2.8.Excel import

When input parameters are already in excel files (*.xls) or can be converted to that format. Comfortable tool for importing can be used. It can be started from **Menu File\Excel Import** , then appropriate file should be picked with file open dialog. When operation is successful then Importing panel is opened automatically. The view can be switched on at any time through **Menu View\Excel import**.

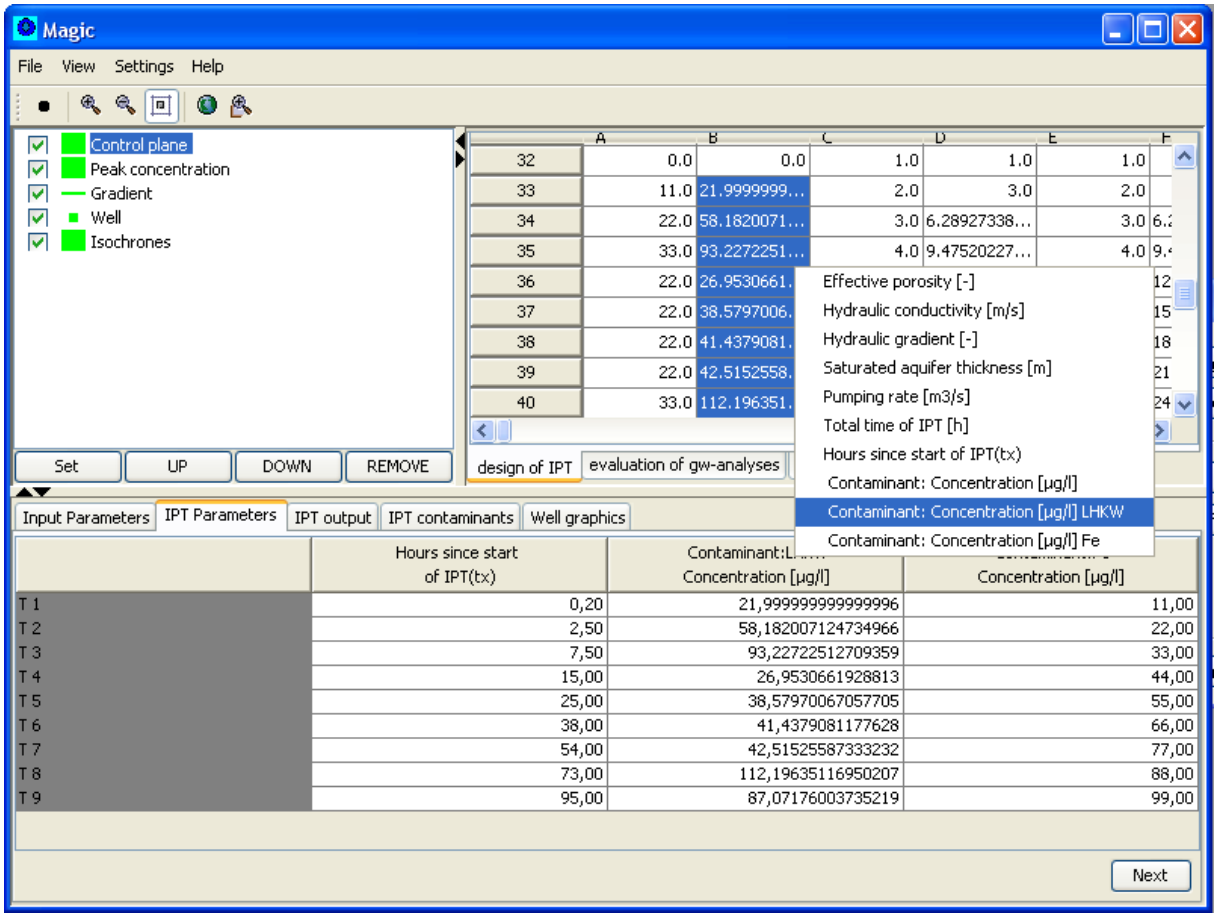


Fig. 21 Import from Excel (xls) panel

Import process consist of selecting proper value and assigning its destination on calculation panel with context menu on right mouse button. For first six menu items only first selected cell value is send to calculation panel. While **Hours since start of IPT** and **Contaminant concentration** copies all selected values in a single column to corresponding table on Calculation panel. (Try ctrl+mouse click to select noncontinuous range).

2.9.Excel export

Export of current project state is performed with Menu File\Export to Excel file. It is easy operation, user is only asked to point path and name of export file and then press **OK** button. Export to Excel file is also a comfortable way to print model and calculations results. If someone has no MicroSoft TM Office then one can use and download OpenOffice TM which is distributed without cost. OpenOfice has built in good export to PDF file , which is comfortable way to exchange printable files.

Following figures show results of export to Excel file. First image is a main application window with Planning panel switched on and minimized legend and bottom panel.

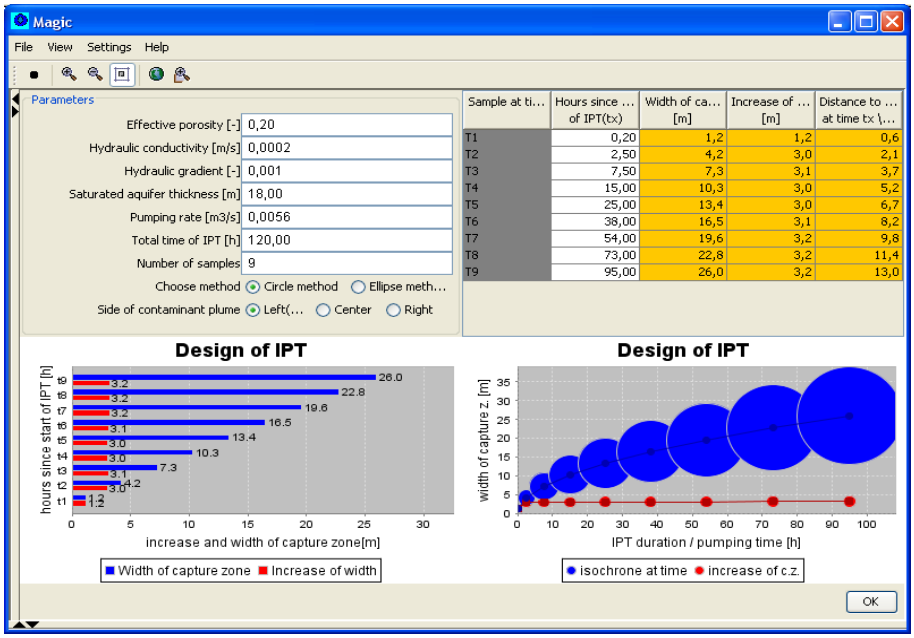

Magic
File View Settings Help
Parameters
Effective porosity [-] 0,20
Hydraulic conductivity [m/s] 0,0002
Hydraulic gradient [-] 0,001
Saturated aquifer thickness [m] 18,00
Pumping rate [m3/s] 0,0056
Total time of IPT [h] 120,00
Number of samples 9
Choose method Circle method Ellipse meth...
Side of contaminant plume Left(... Center Right
Sample at ti... | Hours since ... of IPT(tx) | Width of ca... [m] | Increase of ... [m] | Distance to ... at time tx \...
T1 | 0,20 | 1,2 | 1,2 | 0,6
T2 | 2,50 | 4,2 | 3,0 | 2,1
T3 | 7,50 | 7,3 | 3,1 | 3,7
T4 | 15,00 | 10,3 | 3,0 | 5,2
T5 | 25,00 | 13,4 | 3,0 | 6,7
T6 | 38,00 | 16,5 | 3,1 | 8,2
T7 | 54,00 | 19,6 | 3,2 | 9,8
T8 | 73,00 | 22,8 | 3,2 | 11,4
T9 | 95,00 | 26,0 | 3,2 | 13,0
Design of IPT
hours since start of IPT [h]
increase and width of capture zone[m]
Width of capture zone
Increase of width
Design of IPT
width of capture z. [m]
IPT duration / pumping time [h]
isochrone at time
increase of c.z.
OK

Fig. 22 Planning panel

Next figure shows results of export tabular data, some informations is presented with chart graphics.

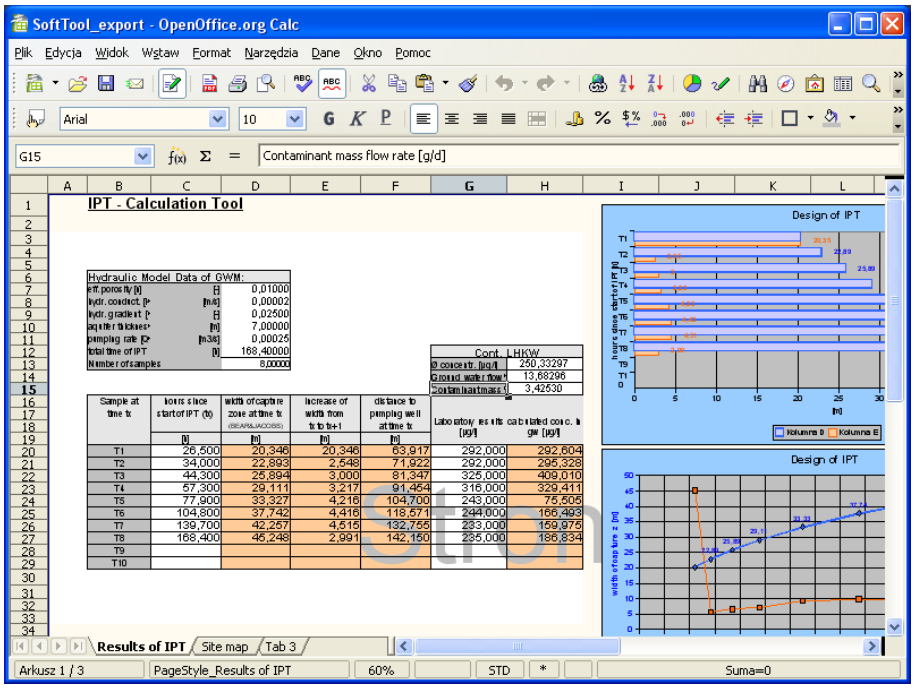


Fig. 23 File exported to Excel xls opened in OpenOffice

On a second worksheet tab: **Site map** there is current map view exported as JPG image.

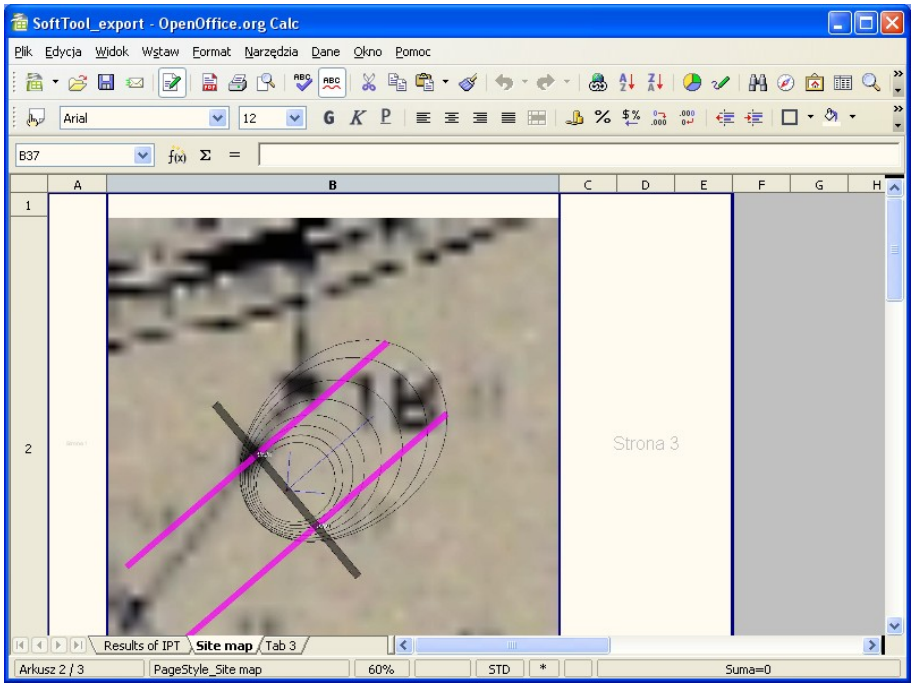


Fig. 24 File exported to Excel xls opened in OpenOffice, site map tab

User can easily adapt export layout to once needs simply by changing template, which is common Excel xls file stored in [SoftTool]\res\export_ipt.xls. User can modify template freely, but has to remember that values are always placed in the same cells. It also concerns map image which is always placed in B2 cell on second worksheet. At the moment only OpenOfficeTM displays Site map properly!

2.10.Help

Menu option **Menu Help\Manual** opens this manual in PDF format version. It can be opened through keyboard F1 function key when operating in application. It assumes that AcrobatReaderTM application is installed on the system.

Anyway it can be found and opened directly from [SoftTool]\res\SoftTool.pdf location.

2.11.Raster referencing

Raster referencing is a simple function of SoftTool to add non professionally calibrated raster to a map panel.

Raster referencing process is started with **Menu File\Raster refernecing** option. It opens file menu dialog, and let choose raster for processing. Once raster is chose it should be shown in panel on the bottom of main window.

Then user should choose button with **+** (cross sign) under real Lower left input boxes, and afterwards point at the main map. After that the same operation should be performed for real Upper Right button. User can input or adjust coordinates manually in text boxes.

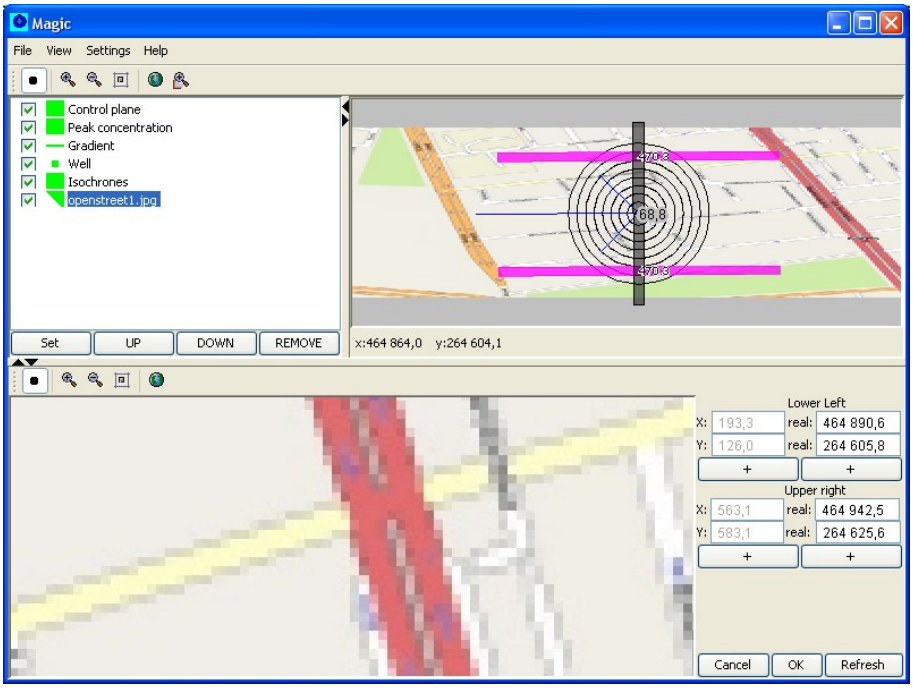


Fig. 25 Very simple raster referencing

Fig. 26 File exported to Excel xls opened in OpenOffice, site map tab

Before pointing at map to get Real **Lower left** or **Upper right** coordinates user is adviced to click - reset tool, on the tool-bar. Otherwise undesirable behavior of main map can occur: e.g. zooming or panning view.

Refresh button refreshes main window map and this way

When button **OK** is pressed image is permanently added to map, and another image can be registered.

Button **Cancel** has no assignment at the moment.